Confidential Report

on

LAKE RESTORATION PROJECTS

Iowa Conservation Plan

Aldo Leopold

Copy No.3

File Iowa Fellowships

11/20/28

Environmental Controls - The Foresters Contribution to Game Conservation.

by

Aldo Leopold - ~~Game Survey, U.S.F.S.~~

Every game crop is the resultant of two forces: (1) the breeding habits of the species, and (2) the environment in which it lives.

Breeding habits are constant. Environment is the variable.

If the environment is favorable there will be a crop; if unfavorable there is no crop, and even the capital stock may decline.

Environment is the summation of many factors - food, cover, predators, hunting, disease, etc.

Bird lovers, by and large, have made the mistake of seeing only one of them, hunting.

Sportsmen, by and large, have made the mistake of seeing none of them. They insist on turning out stock without regard to whether the environment is fit to receive it. If the environment were improved the constant planting of stock would be unnecessary. It is often cheaper to improve environment than to constantly plant game.

Foresters are taught from the outset the futility of plantings in unfavorable environments. They are schooled from the outset to the broad idea of environmental controls. Foresters can render a great service to game conservation by helping to work out a technique of environmental controls for game.

No state stands in greater need of such work than Iowa. The prairie chicken has been crowded out of the state, probably by reason of the elimination of residual patches of prairie cover. The quail is being slowly but surely reduced by the grazing out of woodlots, the devegetation of creek banks and drainage channels, and the elimination of fencerows. Waterfowl are shrinking before the advance of drainage. The only basic remedy is environmental control.

Most thinking conservationists realize this. What they do not realize is that favorable game environments in the past have been accidental, whereas from now on they must be built by human hands and brains, for the deliberate purpose of raising a game crop.

Here enters the mission of game research. It takes more knowledge to put together than to take apart. Just how do we build a quail range? How much cover, and what kind, must be put into this gully to make it produce a covey every year? How can that cover be arranged to give minimum interference to the adjacent crop and maximum erosion control to the adjacent ploughland? What cover-plants produce food as well as cover for the quail? What kinds and numbers of predatory species can be allowed to inhabit it? What supplementary winter feeding

is necessary? When? What mechanical arrangement will prevent winter feed from being covered by snow or sleet, or eaten by less valuable species, when worst needed by the quail?

The exact answers to such questions must be worked out for each species and each region, just as analogous questions are being worked out for each species and region in forestry. Some think a guess is good enough, but foresters know from experience in their own field that technique based on guesses is expensive in the long run. There is a best way. Foresters can help find it.

Agriculturalists as well as foresters can help find it. The technique of environmental controls for game production must be dovetailed to both farming and forestry at every point, else it will never be practiced. Game is essentially a by-product of farming and forestry. If the system of raising the by-product interferes with the main crop, the by-product will not be produced. If it does not interfere, but actually benefits the main crop, economic as well as altruistic forces will eventually bring about its adoption. Most game crops can be made to benefit the main crop.

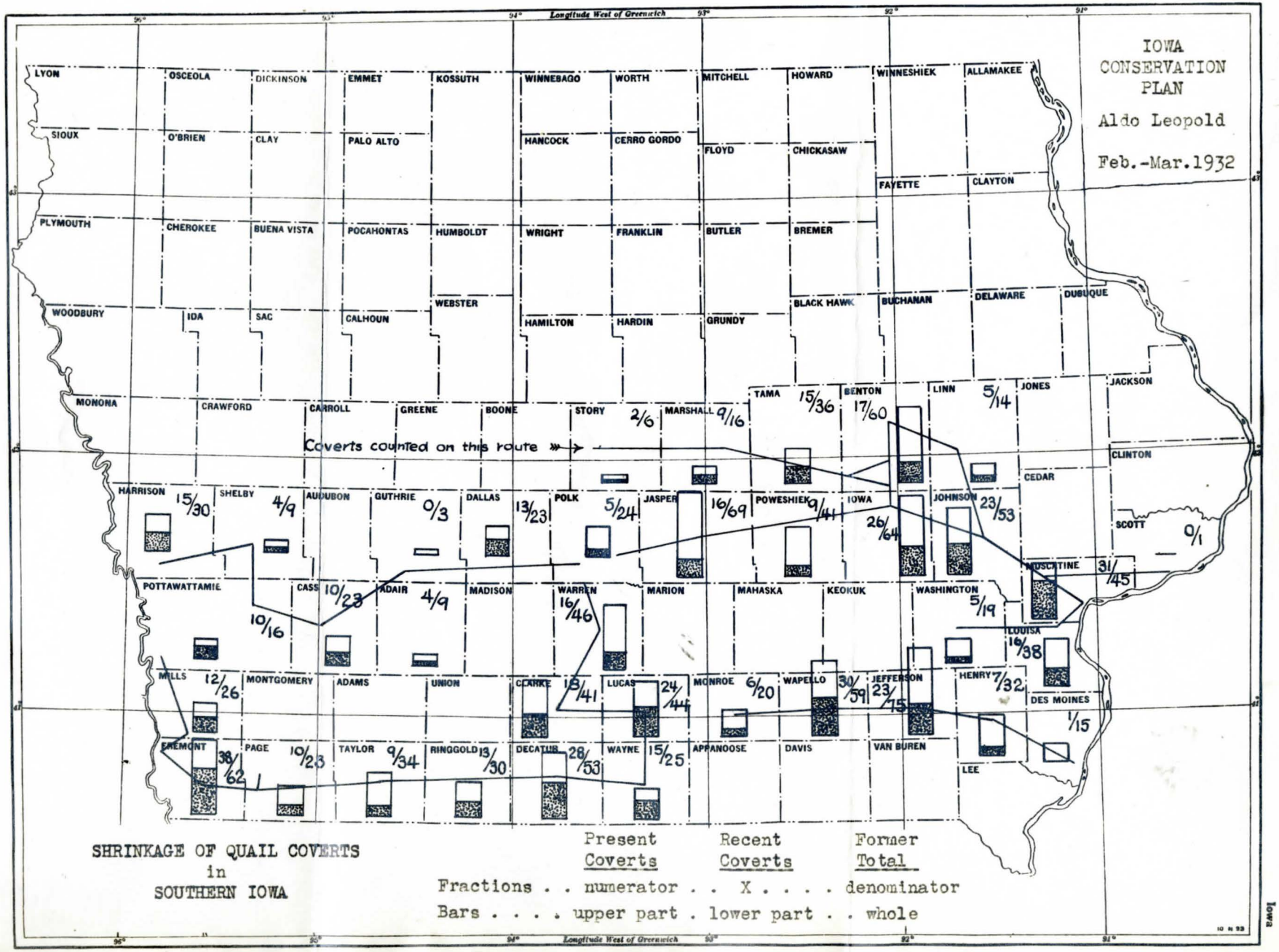
For three reasons, therefore, Ames has the opportunity to do real pioneering in game conservation.

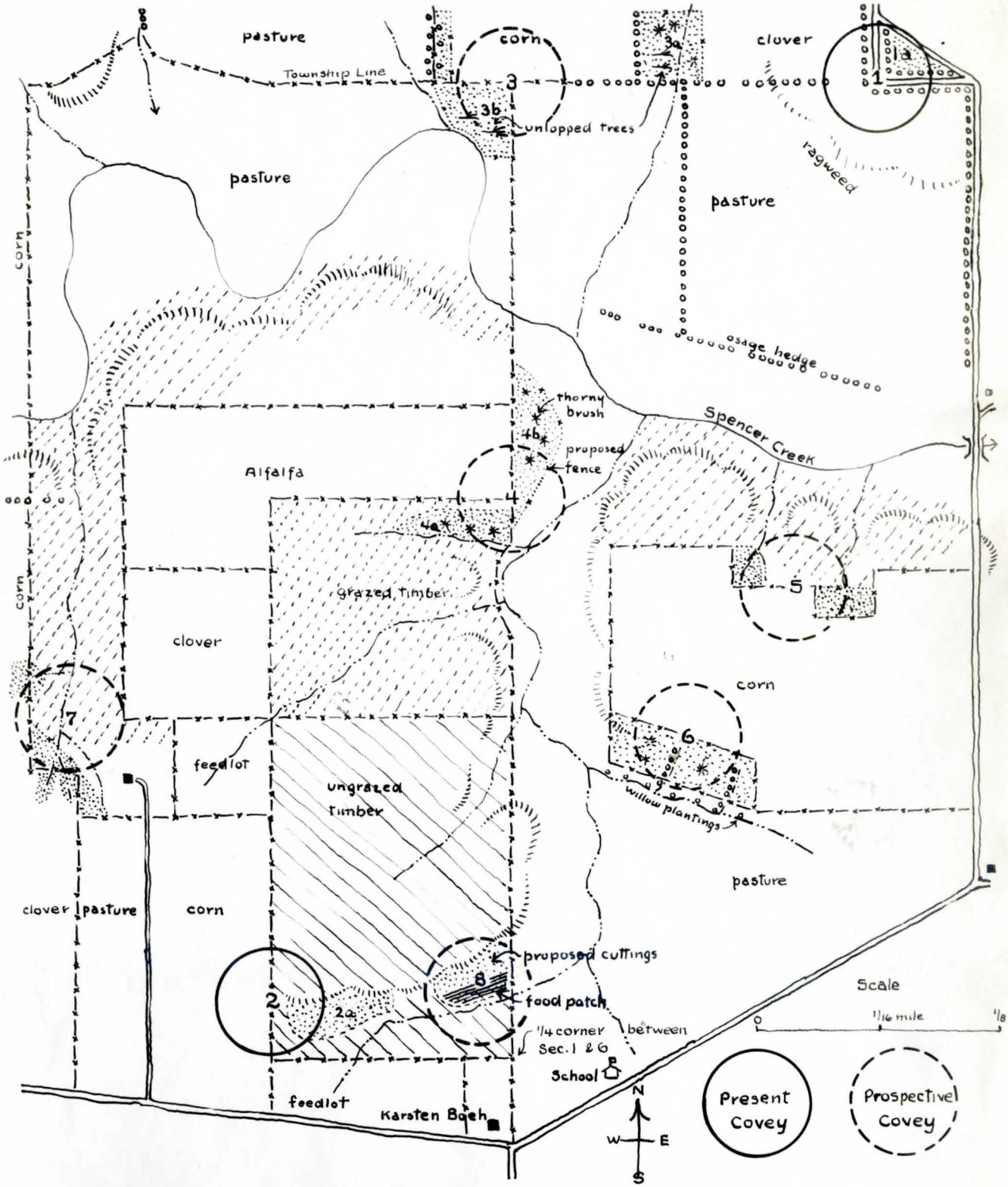
(1) It lies in a state especially in need of environmental controls.

(2) It is the center of agricultural leadership for that state.

(3) It is the center of leadership in farm forestry for that state.

The purpose of this paper is to urge the foresters at Ames to grasp their opportunity. The pioneering is not all done yet. Intellectual pioneering in conservation has just started.


IOWA
CONSERVATION
PLAN
Aldo Leopold
Feb.-Mar.1932
Longitude West of Greenwich
LYON
OSCEOLA
DICKINSON
EMMET
KOSSUTH
WINNEBAGO
WORTH
MITCHELL
HOWARD
WINNESHIEK
ALLAMAKEE
SIOUX
O'BRIEN
CLAY
PALO ALTO
HANCOCK
CERRO GORDO
FLOYD
CHICKASAW
FAYETTE
CLAYTON
PLYMOUTH
CHEROKEE
BUENA VISTA
POCAHONTAS
HUMBOLDT
WRIGHT
FRANKLIN
BUTLER
BREMER
WOODBURY
IDA
SAC
CALHOUN
WEBSTER
HAMILTON
HARDIN
GRUNDY
BLACK HAWK
BUCHANAN
DELAWARE
DUBUQUE
MONONA
CRAWFORD
CARROLL
GREENE
BOONE
STORY
MARSHALL
TAMA
BENTON
LINN
JONES
JACKSON
CLINTON
CEDAR
HARRISON
SHELBY
AUDUBON
GUTHRIE
DALLAS
POLK
JASPER
POWESHIEK
IOWA
JOHNSON
SCOTT
POTTAWATTAMIE
CASS
ADAIR
MADISON
WARREN
MARION
MAHASKA
KEOKUK
WASHINGTON
MUSCATINE
LOUISA
MILLS
MONTGOMERY
ADAMS
UNION
CLARKE
LUCAS
MONROE
WAPELLO
JEFFERSON
HENRY
DES MOINES
FREMONT
PAGE
TAYLOR
RINGGOLD
DECATUR
WAYNE
APPANOOSE
DAVIS
VAN BUREN
LEE
Coverts counted on this route
2/6
9/16
15/36
17/60
5/14
15/30
4/9
0/3
13/23
5/24
10/69
9/41
26/64
23/53
0/1
31/45
10/23
10/16
4/9
16/46
5/19
16/38
12/26
18/41
24/44
6/20
30/59
23/75
7/32
1/15
38/62
10/23
9/34
13/30
28/53
15/25
SHRINKAGE OF QUAIL COVERTS
in
SOUTHERN IOWA
Present Coverts
Recent Coverts
Former Total
Fractions . . numerator . . X . . . . denominator
Bars . . . . upper part . lower part . . whole
Iowa



Quail Development Plan

170 Acres in Secs. 1 & 6, T. 78 N. R. 4 E, Scott County

IOWA CONSERVATION PLAN

Aldo Leopold & Wm. Schwenke

Mar. 19, 1932

Confidential Report

on

LAKE RESTORATION PROJECTS

Iowa Conservation Plan

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Made by Aldo Leopold, Oct.,1931--March, 1932
under the direction of Jacob L. Crane, Jr.

for the

STATE FISH & GAME COMMISSION

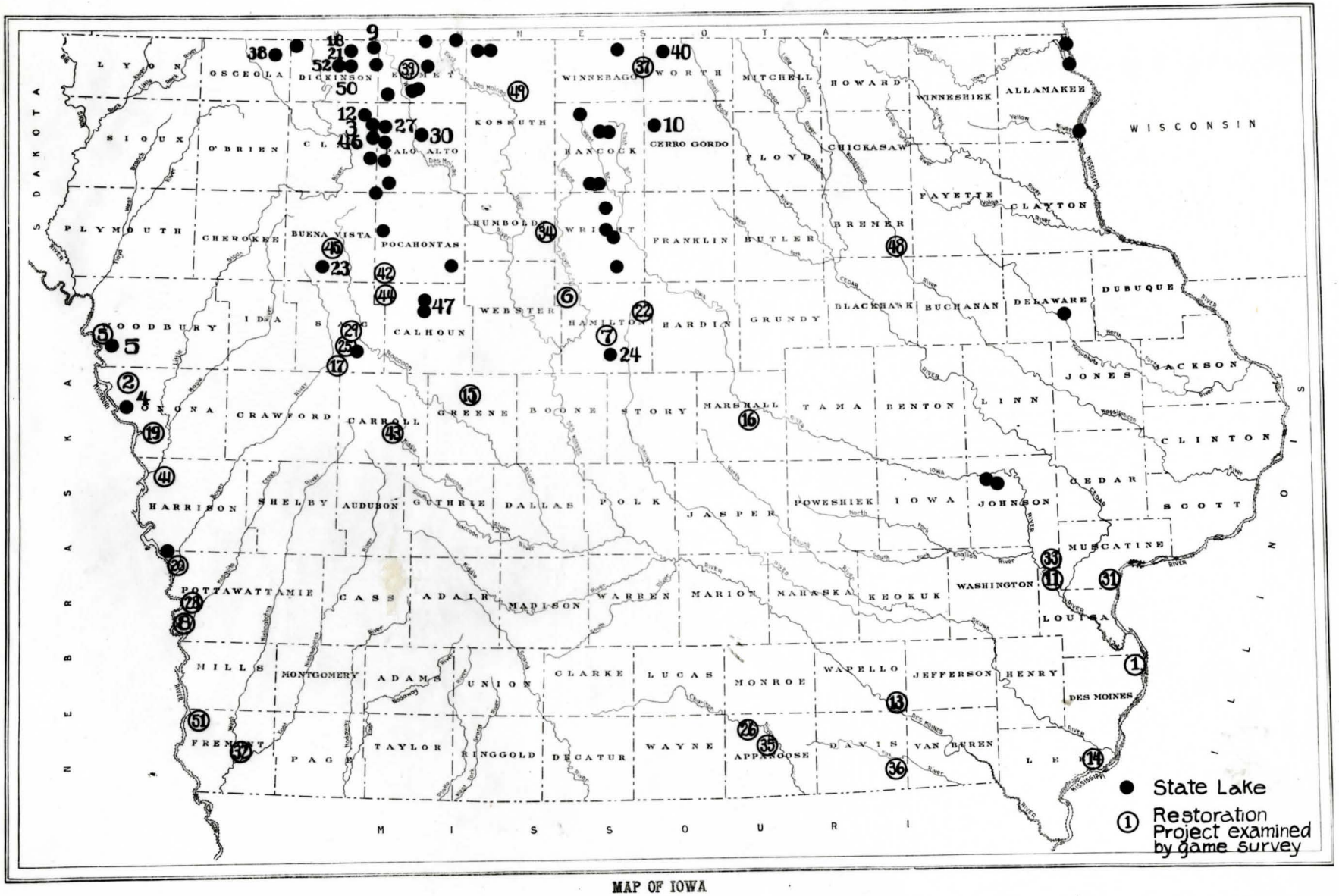
and the

STATE CONSERVATION BOARD

with the financial cooperation of the
Sporting Arms and Ammunition Manufacturers' Institute

Submitted April 2, 1932

NOT FOR PUBLICATION



MAP OF IOWA

Scale 1:500,000

0 5 10 20 30 40 50 Miles

LAKE RESTORATION PROGRAM -- IOWA CONSERVATION SURVEY

Aldo Leopold, 3-5-32

Project number (see map)	Name	County	Class No.[1]	Purpose (Order of importance)						State area[3]		Survey as of April 1		Nature of questions			Estimated costs		Ready for action?	Remarks
				Waterfowl			Upland game	Fishing	Park and recreation	Land	Marsh or water	Map made	Report made	Engineering	Biological	Fiscal or legal	Total	Per acre		
				Nesting	Resting	Shooting[2]											Dollars	Dollars		
1	Allen Green Refuge	Des Moines	(5)	2	1	Refuge	3	None	4	50	50	Yes	Yes	None	None	Yes	2,000	20	Yes	Funds to buy is only question.
2	Badger Lake	Monona	(5)	?	2	(1)	?	3	None	120	(860)	Yes	Yes				12,650	13		
3	Burringer Slough	Clay	(5)	1	4	3	2	None	None	?	570	See	11/22	Yes	None		6,000	10		Hutton to examine.
4	Blue Lake	Monona	(1 or 2)	2	1	(6)	6	3	4	?	(918)	Yes	12/21	Yes			Large	Large	Drop?	Doubt if feasible.
5	Brown's and New Lakes	Woodbury	(1 & 5)	5	3	(4)	5	1	2	1000	(600)	Yes	12/21	Yes		Yes	20,000	13		Suit pending to quiet title.
6	Cady Chase Slough	Hamilton	(7)	3?	4?	2	1	None	None	?	100	Yes	Yes	Yes	Yes		?	?	Drop?	Schnenke to examine. Doubtful.
7	Cairo or Mud Lake	Hamilton	(6)	4	2	(1)	5	3	6	400	1300	Yes	11/5	Yes	None	None	20,000	12		Hutton to examine.
8	Carr Lake	Pottowatamie	(2)	2	1	Refuge	3	5?	4	(40)	(50)	Yes	Yes	None	None	None	300	3	Yes	Arrange for volunteer custodian.
9	Christopherson Slough	Dickinson	(5)	1	3	Refuge	2	None	None	30	140	No	Yes	Yes			3,900	23		Schnenke and Hutton to examine.
10	Clear Lake	Cerro Gordo	(1)	5	3	4	6	2	1	80	(20)	Yes	Yes	None	Yes	None	800	10		Schnenke to examine and select.
11	Cone Marsh	Louisa	(5)	3	2	(1)	4	None	None	?	?	Yes	2/16	None	None		?	?		Schnenke to examine further for possible refuge.
12	Dan Greene Slough	Clay	(2)	1	2	Refuge	3	None	None	100	(285)	Yes	11/22	Done	None	None	3,000	8	Almost	Schnenke select shore property.
13	Eldon Lake	Wapello	(6?)	4	1	(2)	3	None?	None	?	340?	Yes	Yes	Yes	None	None	?	?		Nagler to examine to water holding.
14	Green Bay Bottoms	Lee	(6)	4	1	(2)	6	3	None		3420	Yes	2/13			Yes	68,400	20		Funds to buy is only serious question.
15	Goose Lake	Greene	(3)	3	2	(1)	4	None	None	367	(411)	Yes	Yes	Yes			19,000	24	Yes	Question is one of cost.
16	Goose Pond	Marshall	(6)	?	1	Refuge?	?	?	?		50	Yes	Yes	Yes			1,000	20		Schnenke and Hutton to examine.
17	Goose Pond	Sac	(6)	4	1	(2)	3	None	None		1250	Yes	10/30	Yes		Yes	75,000?	60?		Hutton to examine.
18	Grover Lake	Dickinson	(5)	1	2	3	4	None	?	20	180	No	Yes				5,000?	25		Schnenke to examine. Doubtful.
19	Guard Lake	Monona	(5)		1	Refuge	3	2	?	40	300	Yes	Yes				5,000?	15?		Stability?
20	Honey Creek Lake	Pottowatamie	(6)	?	1	(2)	?	?	?			Yes	No	Yes	None	None				Hutton to examine. Cost?
21	Jammerson Slough	Dickinson	(2)	2	3	Refuge	1	None	None	50	(80)	Yes	11/20	None			2,000	15		Schnenke to examine.
22	Iowa Lake	Hamilton	(6 or 7?)	3	1	(2)	4	?	?		1000	Yes	Yes	Yes		Yes	40,000?	40	Drop?	Doubtful.
23	Little Storm Lake	Buena Vista	(1)	2	1	Refuge	3	?	?	40	(200)	Yes	Yes	None			1,000	25		Schnenke select shore property.
24	Little Wall Lake	Hamilton	(1)	?	1	Refuge	2	?	?	?	(230)	No	Yes				?	?		Schnenke to examine.
25	Lake View Gravel Pits	Sac	(9)	3	4	Refuge	2	1	5	(90)	(60)	No	Yes							No further cost except upkeep.
26	Long Slough	Appanoose	(5)	?	1	Refuge	?	None	None		80	No	Yes	Yes			1,600?	20		Schnenke or Hutton to examine.
27	Lost Island, Mud, Pelican	Palo Alto	(2)	1	2	4?	5?	3	?	1000?	3000?	Yes	Yes	Yes	Yes	Yes	70,000?	18?		Hutton and Schnenke to examine.
28	Manawa Lake	Pottowatamie	(5)	5	4	3	6	2	1											Permanency of present dyke?
29	McCrea Slough	Sac	(5)	2	1	Refuge	3	None	None	100	140	Yes	10/30	None	None	None	5,800	25	Almost	Schnenke select exact land lines to buy.
30	Medium Lake	Palo Alto	(1)	3	1	(2)	3	?	x	110	(991)	Yes	10/17	None	None	None	2,200	20	Almost	Schnenke select exact land lines to buy.
31	Muscatine Slough	Muscatine and Louisa	(3)	?	1	3	6	2	5	?	(1528)	Yes	2/16	Yes	Yes	Yes	?	?		Hutton to examine.
32	Nishnabotna Forks	Freemont	(5)	4	1	(2)	3	None	None		1080	Yes	Yes	Yes	None	None	6,480	6	Yes	
33	Oakland Lake	Louisa	(8)	5	1	Refuge	4	2	3		1000	No	Yes	Yes		None	10,000	10?		Nagler to examine.
34	Owl Lake	Humboldt	(6 or 7?)	4	1	(2)	5	3?	?		800	Yes	11/5	Yes	Yes	Yes	43,000?	50?		Doubtful.
35	Perjue Lake	Appanoose	(5)	5	1	Refuge	3	None	2	120	40	Yes	2/4	Yes	None	None	4,900	30	Yes	
36	Pulaski Lake	Davis	(8)	5	3	Refuge	4	1	2	100?	100	Yes	?	Yes	Yes	None	?	?		Hutton and Nagler to examine.
37	Rice Lake	Winnebago	(3)	4	3	5	6	2	1		(800)						50,000	60	Yes	Primarily an engineering question.
38	Rush Lake	Osceola	(1)	1	2	Refuge?	3	?	?	90	(317)	Yes	Yes	Done	None	None	5,000	55	Almost	Schnenke to select shore property.
39	Ryan Lake	Ensinet	(7)	x	x	Refuge	1	None	None			No	No							
40	Silver Lake	Worth	(1)	4	3	Refuge	?	2	1	?	(318)	Yes	No	Yes	None	None	400			Schnenke to examine for game value.
41	Smith Lake	Harrison	(5)	3?	?	Refuge?	4?	1	2	40	80	No	Yes	None	None	None	2,500	21		Schnenke to examine.
42	Sunken Grove Lake and Burns Slough	Pocohontas	(5)	2	1	4	5	None?	3	80?	80?	Yes	Yes	Yes	None	None	10,000	60		Schnenke to make more accurate map.
43	Swan and Goose Lakes	Carrol	(5)	?	?	?	?	?	?			No	No	?	?	?	?	?		Schnenke to examine.
44	Towhead Lake	Calhoun	(4)	x	x	x	x	None	None		150	Yes	Yes	Yes			x		Drop?	Doubtful feasibility.
45	Toohey Slough	Buena Vista	(6?)	2?	?	?	1?	None	None		170?	Yes	No	?	?	?	1,700?	10?		Schnenke to examine.
46	Trumbull and Round Lakes	Clay	(1 & 2)	5	2	4	3	1	6	259	(1640)	Yes	Yes	None	None	None	7,770	30	Yes	
47	Twin Lakes	Calhoun	(1 & 2)	6	1	(2)	4	3	2	200	(1100)	Yes	Yes	Done			6,800	34		Schnenke to select land.
48	Upper Wapsipinicon	Bremer	(6)	4	1	3	3	?	?	?	?	No	No	None		None	2,000	20		Schnenke to select areas.
49	Union Slough	Kossuth	(6)	1	3	(4)	2	None	None	?	1500	Yes	?	Yes	?	?				Schnenke and Hutton to examine.
50	Warner Lake	Dickinson	(2)	1	?	2	3	?	?	40	(60)	No		None	Yes	None	800	8		Schnenke to select shore property.
51	Waubousie Lake	Freemont	(6)	5	1	(2)	4	3	None	800	500	Yes	Yes	Yes	None	None	6,500?	5?		Hutton to examine.
52	West Hotter Lake	Dickinson	(1)	1	3	4	5	?	2	60	(200)	Yes	Yes	None	Yes	None	1,000?	?		Schnenke to examine.

Total present state acres. (130) (1066$)
Total new state acreage... 5296 17420
5425 28088
Total area..... 33514

Total estimated cost.....$523,500

Total cost divided by total area$ 15.62

[1] Classes: 1. Live public.
2. Dry public.
3. Drained public, restorable.
4. Drained public, not restorable.
5. Live private.
6. Drained private, restorable.
7. Drained private, not restorable.
8. Proposed artificial.
9. Gravel pits.

[2] Shooting: "Refuge" means lake to be wholly a refuge. Figure in circle means part of lake is to be a refuge.

[3] State area: Figures in parenthesis denote acreage already owned by the state.

Table 1.

Confidential Report on

LAKE RESTORATION PROJECTS - IOWA CONSERVATION PLAN

Aldo Leopold
In Charge, Game Survey

Contents. This report contains those findings on lake restoration which are not to be made public, lest they adversely affect the cost of state acquisition and improvement.

It is a summary and interpretation of the detailed project reports, maps, and cost estimates, more or less complete for the 52 projects here listed, and contained in a "Lake Restoration File" in the office of the Conservation Plan.

A tabulated summary of the 52 lakes appears in Table 1. Their geographic position appears on the map.

Choice of Projects. The 52 projects probably represent a cross section of the available opportunities in Iowa, in the sense of including all types of lakes suitable for game, but not in the sense of reflecting the relative frequency of each. The large expensive projects are probably over-represented. Artificial lake opportunities are under-represented.

Projects were selected either because of local interest in them, or geographic position, or the fact that an exceptional opportunity existed to buy cheaply, or in order to sample a type not yet covered.

A few of the projects are already rejected; others on closer engineering analyses may be found impracticable.

Ownership Classification. The 52 projects, with respect to ownership and physical condition, fall into the following classes:

Table 2.

Class 1.	Live public lakes (needing improvement of some sort). . .	10
2.	Dry public lakes, restorable.	6
3.	Drained public lakes, probably restorable	3
4.	Drained public lakes, probably not restorable	1
5.	Live private lakes, to be acquired by the state	17
6.	Drained private lakes, to be acquired and restored . . .	8
7.	Drained private lakes, probably not restorable	4
8.	Proposed artificial lakes to be constructed by the state .	2
9.	Gravel pit lakes	1
		52

Functional Classification. Under "Purpose" the table gives an estimate of the order of importance of the functions or purposes of each project. Thus the Allen Green Refuge (Project 1) is most valuable as a resting place or refuge, next most valuable as a breeding ground, third as an upland game covert, and fourth as a recreation area. It contains no fish.

The number of projects rating first, second, and third for the six functions recognized in Table 1 are as follows:

Table 3.

Function	Number of Projects Rating			
	First	Second	Third	Total
Nesting	9	8	7	24
Resting	24	9	8	41
Shooting	4	11	3	18
Upland Game	4	5	15	24
Fishing	5	7	8	20
Parks & Recreation	3	6	2	11

The ratings are as of the proposed, not the present, condition.

The projects which should be entirely closed to all shooting are marked "refuge" under "shooting" in Table 1, and usually have "resting" designated as their first function. There are 19 such.

The projects which should have part of their area set aside as refuge are marked with a circle under "shooting" in Table 1. There are 23 such. Hence 42 of the 52 projects should be all or partly refuge.

None of these refuge classifications should be regarded as inflexible. Whatever ground is delimited as a refuge should of course be an inviolate sanctuary at all seasons (see Refuge Policy), but the best size and boundary lines for the refuge can be determined by experience much better than by an advance guess. The way the birds react to the proposed improvements, and to the use of the lake by people, and the relation of the lake after it is improved to other feeding, resting, and shooting grounds, must all enter into the question of best location and size for a refuge. Final locations and boundaries, in short, are a cut-and-try job, the exact outcome of which cannot be predicted during a survey. It is a matter for gradual administrative adjustment.

Of the 52 lakes, 19 have no fish, or only rough fish, and therefore have no fishing value. (But Table 3 shows five as of outstanding value for fishing.)

Of the 52 lakes, 18 have no "park value" in the sense of timbered shores of the kind ordinarily regarded as suitable for summer playgrounds. (But Table 3 shows three as of outstanding value for this purpose.)

Size Classification. This is difficult, because some of the projects deal with the improvement of some part of an existing lake. Counting entire units only, and proposed new state water or marsh area only, and dropping rejected projects, the size classes are:

Table 4.

Size class (water area)	No. of lakes
Under 50 acres	3
50-100 acres	6
100-200 acres	5
200-500 acres	4
500-1000 acres	5
1000-2000 acres	5
Over 2000 acres	2
	30

In the "area" column of Table 1, figures in parenthesis indicate acreage already owned by the state, whether dry or wet. Figures under the "marsh or water" column without parenthesis represent either proposed new state water acreage, or private water acreage to be brought under state control.

Cost of 52 Lakes. The cost estimates in Table 1 are rough. They are, if anything, lower than what will actually have to be paid. The "per acre" costs are the estimated total expenditure for land, water, or improvements on each project spread over the area to be purchased or improved. In Class 6, 7, or 8 lakes, many of which require engineering works not yet planned in detail, the cost figures are either lacking

or very rough.

The per acre figures are believed to be auseful way to raise the question of whether certain projects are unduly expensive.

The total cost of restoring the 52 lakes is estimated to be:

Table 5.

Class	No. of Projects	Cost Estimates	No. without Cost Estimates	Probable total cost of 52 lakes
1	9	$ 44,970	2	$ 49,900
2	5	76,100	0	76,100
3	2	69,000	1	75,000
4	0	0	1	0
5	13	67,830	4	110,000
6	7	255,600	4	350,000
7	0	0	1	0
8	1	10,000	1	15,000
9	0	0	1	0
	37	523,500	15	676,000

Cost of Complete Program. The ultimate question, toward which all the preceding evidence aims, is this: How much money will the state have to raise in order to carry out a statewide lake restoration program?

The following estimates proceed class by class.

There are 63 meandered (state owned) lakes left in Iowa (see Iowa Lakes, Parks, and Streams, p. 25) which collectively constitute Classes 1 and 2 of Table 5. Fourteen of these, or about a fourth of the total, are included in the 52 projects, and will cost $125,000. This figure includes one very expensive and as yet problematical development (No. 27)

at $70,000, which constitutes over half the total. There may, however, be some of these expensive engineering jobs, aimed at the stabilization of water levels, in Class 2 (public lakes dry in 1931, and probably dry again in the next drouth period). It seems probable that Class 1 and 2 lakes will need a total of $300,000.

There are 12 meandered drained lakebeds still wholly or partly owned by the state. These constitute classes 3 and 4 of Table 5. Six of these (constituting 4 projects, because Muscatine Slough is listed as one instead of three lakes) are included in the 52 projects. The question is how many of the remaining 6 are likely to fall into Class 3 (restorable), and what will they cost. The remaining 6 are mostly small. It seems that $125,000 will cover all of Classes 3 and 4.

Class 5 (live private lakes) is a matter of how far the policy of state acquisition is to be carried. It is conservative to estimate that the state should acquire at least one private lake per county, or 5 times as many as the 52 projects include. This would call for $500,000.

Classes 6 and 7 (drained private lakes) already cover many of the larger lakebeds, but only a small part of the levee and pumping projects now tending to go bankrupt, and presenting attractive opportunities. A total outlay of double the present program, or $700,000, would seem conservative.

Class 8 (artificial lakes) are more a matter of fishing and general recreation than of game. An arbitrary estimate of $100,000 is offered.

Class 9 (gravel pits) are often already in public ownership. An

arbitrary estimate of $50,000 is suggested.

Casting up these estimates:

Table 6.

Complete Lake Restoration Program

Class	52 Projects Cost	Computation	Total Cost
1 & 2	$125,000	1/4 covered	$300,000
3 & 4	75,000	1/2 covered. Remainder small	125,000
5	110,000	1 per county, 1/5 covered	500,000
6 & 7	350,000	Double present program	700,000
8	15,000	Arbitrary estimate	100,000
9	0	Arbitrary estimate	50,000
	$676,000		$1,775,000

In broad terms we can now say that no lake program carrying less than $1,000,000 would be adequate, and none carrying over $2,000,000 will be necessary.

Organization. The lake restoration job involves four big problems:

1. Financing acquisition program.
2. Acquisition methods and personnel.
3. Administrative methods and personnel.
4. Maintenance costs.

A very sketchy discussion of these is here offered as a tentative guide to present actions.

The ihitial acquisition cost is quite evidently within the money-raising capacity of an enlarged license fee, spread over a period of years. The participation of the federal government, both in federal

purchase of interstate boundary lands, and in federal aid through the proposed ammunition tax, should be highly acceptable to the state.

The question of methods presents one basic difficulty: It will be impossible to educate the public to demand an enlarged license for lake work without inflating the asking price of lake lands. The only recourse I can see is to adopt the policy of using local pressure to secure favorable options, and buying only where such options are really favorable.

A program of this size will also require the services of an expert land-buyer. I suggest one be borrowed from the U. S. Forest Service or the U. S. Biological Survey.

The need of a technical personnel to select projects, and to formulate and improve the practice of management, is obvious. At least one full-time waterfowl research man will be needed at Ames, plus a considerable fraction of the time of the Executive Secretary and of the Superintendent of Game and of Fish.

The question of administration and maintenance also involves the unsolved problem of custodian services. The idea of a full-time resident custodian for each project should be rejected at the outset. The best principle to follow would seem to be that of the "Per Diem Guard" system developed by the Forest Service for fire control. This consists, in short, of a local resident, selected by and under the supervision of the District Ranger (Game Warden), who keeps his eye open at all times, and enters upon active duty when conditions demand it.

The administrative problems involved in public shooting grounds are discussed under the "waterfowl" chapter.